

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### A Method and Apparatus for Sealing Containers of Synthetic Plastic Material

I, NORBERT HAGEN, a German citizen of Stadwaldstrasse, Kuppenheim/Murgtal, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method and an apparatus for sealing synthetic plastic material containers with a welded-on disc of synthetic plastic material.

Bottle-shaped marketable containers for oil and other liquids are known which are made of synthetic plastic material and are provided with welded-on closures. Thus, for example, it has already been proposed to seal such containers by means of an aluminium foil which has a layer of synthetic plastic material on its underside. A foil of this kind is placed on the neck of the container after it has been filled and then is heated to such an extent by a heating element that the underside of the foil facing towards the container becomes welded to the upper rim of the neck. A closure of this kind cannot be opened by an unauthorized person. Any attempt to open such a closure would be evident immediately and if the closure is undamaged, the person buying the container has a guarantee that the contents have not been tampered with.

Hitherto, a fairly considerable amount of manual work has been required in order to produce such closures and the object of the present invention is to overcome or at least reduce this disadvantage.

According to the invention there is provided a method of sealing a synthetic plastic material container with a welded-on disc of synthetic plastic material, in which method the container is arranged below an aperture plate of a punching machine, a heated punch punches out a disc from a composite strip

having a lower layer of synthetic plastic material and an upper layer of material which substantially does not adhere to the hot punch, the disc falls through the aperture onto the neck of the container and is then welded onto the neck by the heated punch which has been lowered so as to achieve this.

Also according to the invention there is provided an apparatus for the sealing of synthetic plastic material containers with a welded-on disc of synthetic plastic material, which apparatus comprises means for holding a container to be sealed below an aperture plate of a punching machine, a heated punch for first punching out a disc from a composite strip having a lower layer of synthetic plastic material and an upper layer of material which substantially does not adhere to the hot punch, the disc being arranged to fall onto the bottle neck rim or mouth, and by appropriate lowering, the heated punch then being arranged to weld the disc to the bottle neck.

The punch may be heated in a simple manner by a built-in heating element and a thermostat may be used to prevent excessive heating.

In order to accelerate the working speed of the installation, it is expedient to preheat the composite strip upstream of the punching machine by means of, for example, a heated duct, which can be heated electrically if appropriate. The acceleration of the welding operation is important, since a relatively short application of the punch against the disc is then sufficient to heat the edge portion of the disc and the bottle neck sufficiently to bring about the desired welding effect with the simultaneous application of pressure.

The heating of the strip upstream of the punching machine may also be effected by ray-emitting sources which are directed from

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above and below against the flat sides of the strip. At each pre-heating operation and if appropriate, the plastic underside of the strip, which is to be welded to the bottle neck, may be pre-heated to a greater extent than the upper surface of the foil.

The composite strip may, before arriving at the punching machine, travel through a stamping device in which any desired information, for example, the bottle contents, the batch number, the date of filling or any other such information, may be marked on the disc which has still to be punched-out. Instead of stamping these details into the strip, they may be added by printing in one or more colours and the stamping or printing may be carried out by means of a ram. Alternatively, a rolling cylinder may be provided which does not require any special drive but which is automatically rotated by the feeding of the strip.

The stamping or printing device may be combined with the strip pre-heating device which precedes the punching machine.

The installation may operate in a fully automatic manner, for example, supplying the bottles to be sealed by a conveyor, which is synchronised with the punching machine and, if appropriate, also with the stamping or printing device.

Constructional embodiments of the invention are illustrated diagrammatically and by way of example in the accompanying drawings, in which:

Figure 1 is a view partly in section showing the method of operation of the apparatus;

Figure 2 is a front view of a practical form of the apparatus;

Figure 3 is a plan view;

Figure 4 is a section on the line 4—4 in Figure 3; and

Figure 5 shows the abutments for the bottles to be introduced into the apparatus.

As shown in Figure 1, the bottles 10 of synthetic plastic material which are to be sealed are fed by a belt conveyor 11 which slides on a support 12, the bottles being guided along below an aperture plate 13 of a punching machine in this way. The punch 14 of the punching machine is provided with a built-in heating element 15. At each punching operation, the punch 14 punches a disc 17 out of a composite strip 16 consisting of an upper layer of, for example, aluminum foil and a lower layer of thermo-plastic material, which disc falls on to the bottle 10 and is then heated by the appropriately-lowered heated punch 14 which further applies pressure and so welds the disc 17 to the bottle 10.

Before the composite strip 16 is punched by the punch 14, it is pre-heated by passing through a duct 18 which is electrically heated by heating elements 19. A stamping device for the closure discs 17 is associated with the

heating duct 18 and consists of a stamping ram 20 having on its end face an engraving 21, and a pressure plate 22 situated below the strip 16. When the strip 16 travels through the duct 18, the strip is stamped with any desired information at those regions which are subsequently to be punched out. In this connection, the end face of the punch 14 may be concave in shape so as not to damage the details stamped into the plastic.

The rim of the end face of the punch 14, which provides the application pressure necessary for welding, is advantageously provided with knurling in order to exert a stronger welding action on the edge portions of the disc 17 when pressure is applied. As is known, such a measure considerably facilitates and accelerates welding.

The shape and size of the bottles 10 is not important and it is also immaterial how the bottle neck 23 is shaped. In the construction shown in Figure 1, the bottle neck terminates in a thickened bead-rim 24, and below the head a severing line 25 may be pre-marked along which the beaded rim 24 may be easily severed by means of a knife. The screw thread 26 provided on the outer surface of the bottle neck makes it possible to surround the neck with a screw-on cap during the period when the bottle has been opened and the contents have not been completely used. It would be equally possible, however, to close the container at such times by means of a stopper fitted into the bottle neck.

The machine may be used to seal any bottles or containers made of thermoplastic material. It is only important that the closure disc shall comprise a composite disc consisting of two layers at the time of sealing the bottle or container. Thus, it may comprise, for example, aluminium or Cellophane, or paper as one layer, and a thermoplastic material for bonding to the bottle as the other layer, the word Cellophane being a registered Trade Mark.

The apparatus shown in Figures 2 to 5 has a supporting frame 30 with an extended front wall 31 on which the important parts of the machine are mounted. The frame 30 is slidably guided in four vertical columns 32 which are fixed on a base plate 36. In a cross-member 34, Fig. 3, of the frame 30 is a screw-threaded spindle 35, the free end of the spindle extending as far as the base plate 36. Thus, by turning the spindle 35, the frame 30 and all the parts arranged on it, can be adjusted in the vertical direction in order to permit the apparatus to be used for bottles of varying heights.

In order to seal the bottle 37 with a welded-on synthetic plastic material disc, the apparatus uses two foils which come one from each of two vertically-spaced reels 38 and 39. The upper reel 38 supplies a strip

40 which is so made that it does not remain adhering to the hot punch of the sealing apparatus and which may be made of, for example, aluminium, paper or Cellophane. The lower reel 39, on the contrary, supplies a strip 41 of thermoplastic material.

The two strips 40 and 41 are guided jointly about a guide roller 42, over a female die 43, then around a guide roller 44 and between two conveying rollers 45 and 46 which are resiliently pressed against one another by a spring 47. The roller 45 is provided with a pawl drive which is shown in Figure 3 and which after each punching operation advances the strips 40 and 41 by the required amount.

An electrically-heated punch 48 is arranged on a slide 49 which in Figure 2 is shown in its upper position. The slide 49 slides on the front side of the wall 31 between prismatic-section guide bars 50 and 51, the bar 51 being adjustable by means of screws 52 which are lockable by means of screws 53. Current is supplied to an electrical heating element 54, see also Figure 4, through leads which are fixed to clamping screws 55. The heating element 54 heats a copper plunger 56 which itself supplies heat to the punch 48, insulations 57 and 58 preventing lateral dissipation of heat. The punch 48 is held in its operative position by a sleeve 59.

Referring to Figure 3, the punching movement of the slide 49 with the punch 48 is effected by a hydraulic cylinder 60 which acts on one end of a plate lever 61 which is mounted at 62 on the side walls of the frame 30. The other end of the lever 61 acts on extensions 62 which are welded to the rear side of the slide 49 and extend through an aperture 63 in the wall 31.

An extension 64 is fixed to the lever 61 and carries an adjustable finger 65. On the downward movement of the slide 49, the finger 65 presses downwards a lever 67 which is mounted on a pin 66 and which, by way of an extension 68, presses an advancing pawl 69 downwards. The pawl 69 is in engagement with a ratchet wheel 70 which is moved on the shaft 71 of the conveying roller 45. As soon as the slide 49 moves upwards, the pawl 69 is also lifted by spring force, whereafter the pawl 69 causes the ratchet wheel 70 and with it the roller 45 to rotate, the roller 45 then drawing the two strips 40 and 41 forwards by the necessary amount.

The bottles 37 which are to be sealed are introduced by hand, angle rails 73 and 72 (Figures 2 and 5) being used as a lateral guide and as a rear abutment, respectively. A guide 74 may be provided for the bottle neck so as to ensure that the neck will be situated exactly below the punch 48. The abutments 72 to 74 are adjustable so that the machine can operate with containers of

various dimensions. If appropriate, as shown in Figure 5, the arrangement may include a limit switch 75 comprising a switching lever 76 which operates the switch when a bottle 37 is introduced. As a result, the hydraulic cylinder 60 is operated and the piston moves upwards while the slide 49 with the punch 48 moves correspondingly downwards. The punch 48 moves through an aperture 77a in a stripper plate 77 (Figure 2) and then, when the punch enters an aperture 43a in a female die 43 it punches out of the strips 40 and 41 blanks which correspond to the cross-sectional shape of the punch 48. The blanks are guided downwards by the punch 48 on to the rim 37a of the bottle 37 and they are then pressed against the rim 37a. In this its lowest position, the punch 48 remains a time sufficient to heat the blank to the extent which is necessary to effect the desired welding of the plastic foil 41 to the bottle neck rim 37. This period of time may vary considerably depending on the thickness of the foil 41; for example, it could last 0.5 of a second but could also last for three seconds. An adjustable switch ensures that the punch will remain in its lower position until the welding has been completed. When the punch 48 moves upwards again, the stripper plate 77 prevents the foils 40 and 41 from ascending at the same time, whereafter towards the end of the withdrawal of the punch 48, the two strips 40 and 41 are advanced in the manner already described by means of the pawl and ratchet gear 69 and 70.

The sealing apparatus described hereinbefore may, however, be fed mechanically. In that case control will be effected synchronously with the feed of the bottles. The separating foils punched from the strip 40 may remain on the sealed bottle or alternatively they may be removed after the sealing foil has cooled. In the former case, the discs may be punched from a single composite strip having a lower synthetic thermoplastic material layer. In the second case, the lower layer 41 is conveniently made of the same material as that of which the bottles 37 are made.

The machine is so constructed that new reels 38 and 39 may be inserted from the front.

The containers sealed by an apparatus exemplifying the invention may be used in the chemical industry and the foodstuffs industry, for example, as oil bottles, chemical bottles, milk bottles, vinegar bottles, and honey containers.

#### WHAT I CLAIM IS:—

1. A method of sealing a synthetic plastic material container with a welded-on disc of synthetic plastic material, in which method the container is arranged below an aperture plate of a punching machine, a heated punch

5 punches out a disc from a composite strip having a lower layer of synthetic plastic material and an upper layer of material which substantially does not adhere to the hot punch, the disc falls through the aperture onto the neck of the container and is then welded onto the neck by the heated punch which has been lowered so as to achieve this.

10 2. A method of sealing a synthetic plastic material container with a welded-on disc of synthetic plastic material, substantially as herein described.

15 3. An apparatus for the sealing of synthetic plastic material containers with a welded-on disc of synthetic plastic material, which apparatus comprises means for holding a container to be sealed below an aperture plate of a punching machine, a heated punch for first punching out a disc from a composite strip having a lower layer of synthetic plastic material and an upper layer of material which substantially does not adhere to the hot punch, the disc being arranged to fall onto the bottle neck rim or mouth, and by appropriate lowering, the heated punch then being arranged to weld the disc to the bottle neck.

25 4. An apparatus as claimed in claim 3, in which the punch has a built-in heating element.

30 5. An apparatus as claimed in claim 3 or claim 4, in which a pre-heating duct is provided for pre-heating the composite strip before a disc is punched from the strip.

35 6. An apparatus as claimed in claim 3 or claim 4, in which a ray-emitting source is provided for pre-heating the composite strip before a disc is punched from the strip.

40 7. An apparatus as claimed in claim 5 or claim 6, in which the underside of the strip of material, which is to be welded to the container neck, is arranged to be subjected to a more intensive pre-heating than the upper side.

45 8. An apparatus as claimed in any of claims 3 to 7, in which a stamping or printing device is provided for stamping or printing

information upon the strip before it is fed to the punching machine.

9. An apparatus as claimed in claim 8 as appendant to any of claims 5 to 7, in which the stamping device is combined with the pre-heating duct or ray-emitting system. 50

10. An apparatus as claimed in any of claims 3 to 9, in which a conveyor is provided for supplying containers which are to be sealed, which conveyor is synchronised with the punching machine and, if appropriate, also with the stamping device. 55

11. An apparatus as claimed in any of claims 3 to 10, in which the punch is actuable by hydraulically-operated means. 60

12. An apparatus as claimed in any of claims 3 to 11, in which the punch is mounted upon a slide which is adapted to be moved vertically. 65

13. An apparatus as claimed in any of claims 3 to 12, in which the strip used in the making of the disc is arranged to be fed to the position above the container necks from two separate reels, one of the reels providing an upper layer of a material which substantially does not adhere to the hot punch and the other of the reels providing a lower layer of a thermoplastic material. 70

14. An apparatus as claimed in any of claims 3 to 13, which comprises means for ensuring that the punch shall remain in its lower or operative position until the welding of the disc has been completed. 75

15. An apparatus for the sealing of synthetic plastic material containers with a welded-on disc of synthetic plastic material, substantially as herein described with reference to Figure 1, or to Figures 2 to 5, of the accompanying drawings. 80 85

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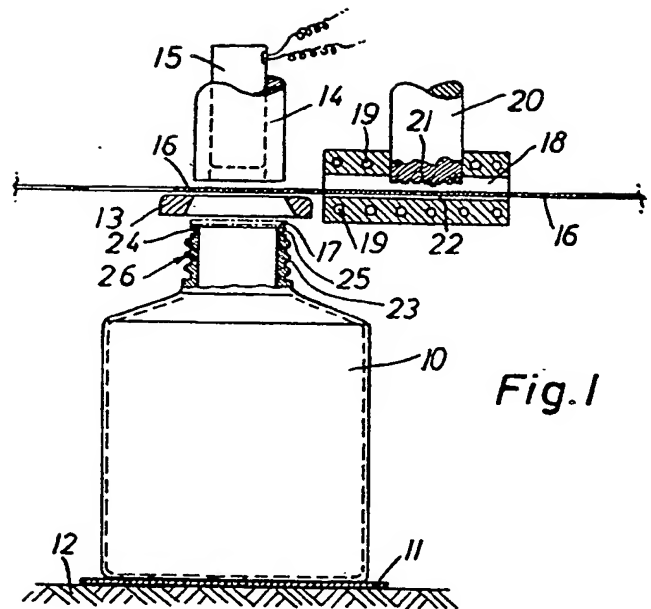


Fig. 1

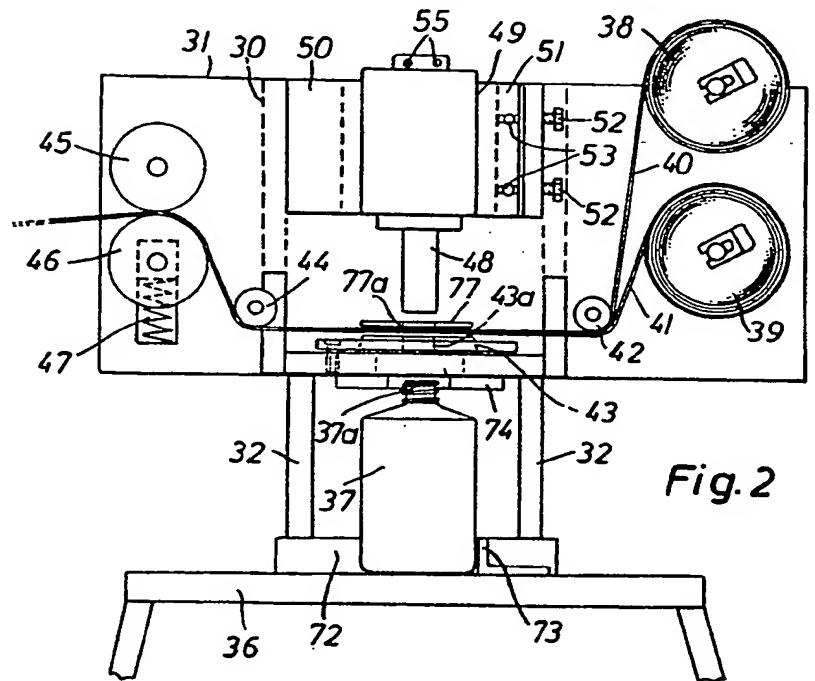
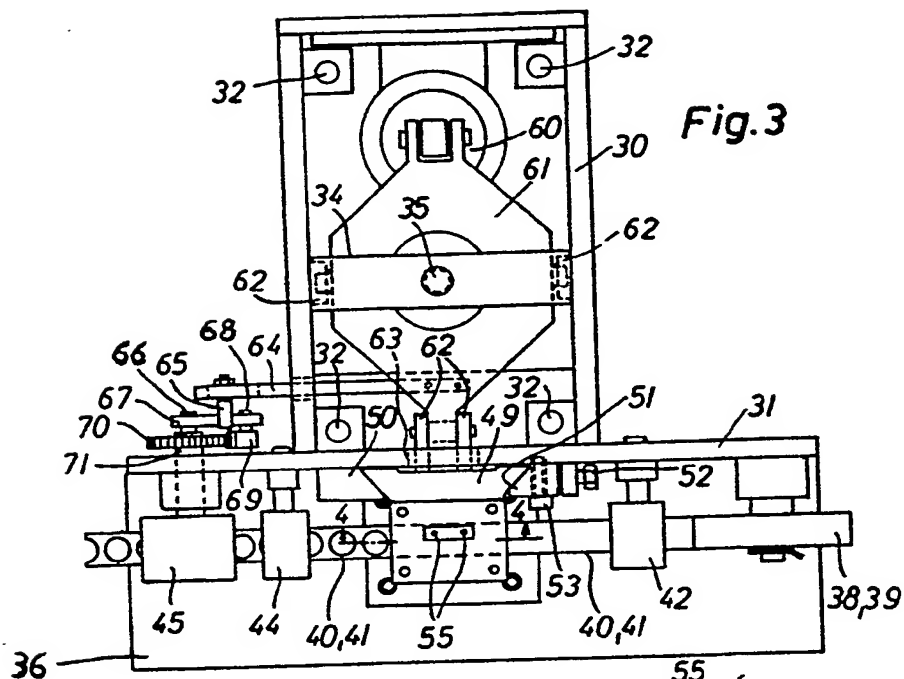
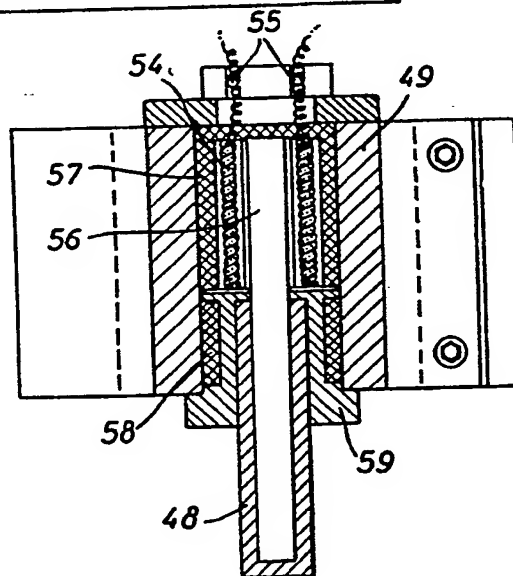


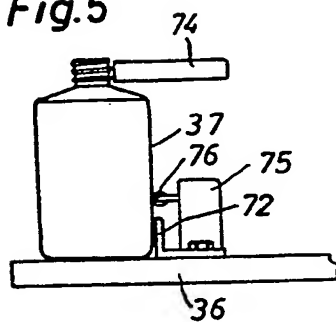
Fig. 2



**Fig. 4**



**Fig. 5**



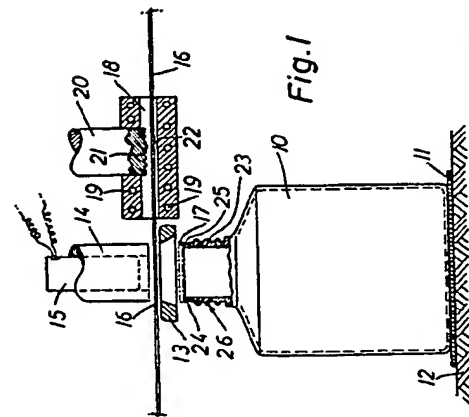


Fig. 1

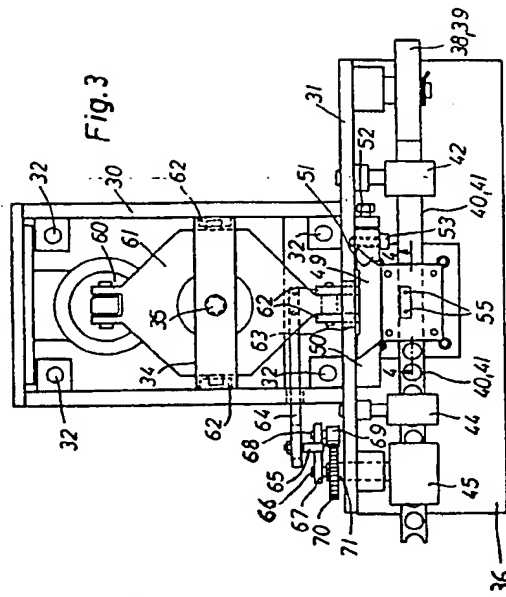


Fig. 3

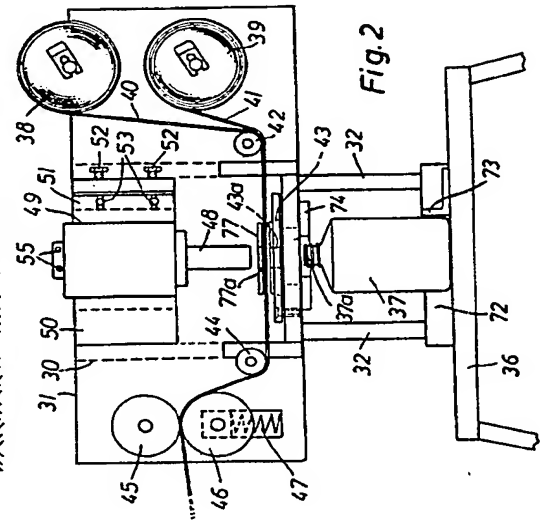


Fig. 2

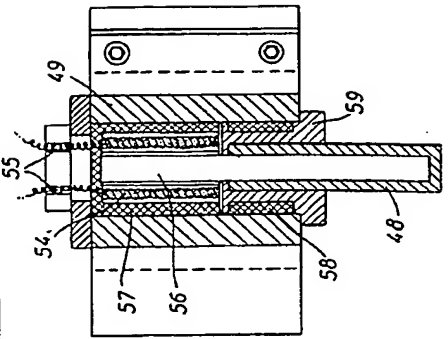


Fig. 4

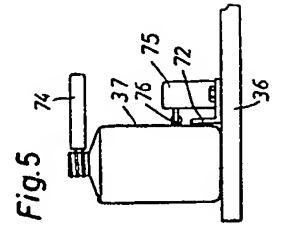


Fig. 5

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